

Who is experiencing differential impact from HIV/AIDS? Technical notes and data tables

Explanation of population and age adjusted rates

A “rate” of a disease per 100,000 population is a more precise way to compare groups that have substantially different population sizes rather than relying on the raw number of cases. For example, the number of people living with HIV/AIDS on December 31, 2005 who are Hispanic, is 3,975, whereas the number of people living with HIV/AIDS who are white (non-Hispanic) is 7,245. Although the *number* of people living with HIV/AIDS who are Hispanic in Massachusetts is smaller than the number of people living with HIV/AIDS who are white (non-Hispanic), we also need to consider that there are far fewer people of Hispanic heritage living in Massachusetts than white (non-Hispanic) individuals. Hispanic individuals represent 6% of the Massachusetts population compared to white (non-Hispanic) individuals, who represent 82% of the population. So, if HIV/AIDS had the same impact on the Hispanic population of the state as on the white (non-Hispanic), then there should be almost 12 times as many cases in white (non-Hispanic) individuals, but there are only about twice as many. By calculating a rate which takes into consideration the differences in the population size, it is evident that the number of people living with HIV/AIDS for every 100,000 Hispanic individuals in Massachusetts is much higher than the rate for every 100,000 white (non-Hispanic) individuals. This is called a “crude rate” and is calculated by dividing the number of people living with HIV/AIDS by the entire population (everyone or the sub-population involved) and multiplying by 100,000. (See example 1.A below).

Example 1.A: Calculation of crude HIV/AIDS prevalence rate for white (non-Hispanic) individuals, Massachusetts (136.0 per 100,000)

$$\begin{aligned}\text{Crude HIV/AIDS prevalence rate for white (non-Hispanic) individuals} &= (\text{number of white (non-Hispanic) individuals living with HIV/AIDS} \div \text{population size of white (non-Hispanic) individuals}) \times 100,000 \\ &= (7,245 / 5,326,585) \times 100,000 \\ &= 0.00136016 \times 100,000 \\ &= \mathbf{136.0 \text{ per } 100,000 \text{ population}}\end{aligned}$$

However, sometimes, in addition to the population size being different, the age composition of the population is different. In Massachusetts, black (non-Hispanic) and Hispanic populations are generally younger than white (non-Hispanic). The median age of black (non-Hispanic) people (29.7 years) and Hispanic people (24.5 years) is younger than that of white (non-Hispanic) people (38.8 years). Therefore, it is necessary to “age-adjust” the HIV/AIDS prevalence rate to get a true comparison of the impact of the disease across racial/ethnic groups without an effect from the differences in age composition. Age-adjustment of rates minimizes the distortion created by differences in age composition.

Age-adjusted rates are calculated by weighting the age-specific rates for a given population by the age distribution of a standard population. The weighted age-specific rates are then added to produce the adjusted rate for all ages combined. (See example 1.B below).

Example 1.B: Calculation of age-adjusted HIV/AIDS prevalence rate for white (non-Hispanic) individuals, Massachusetts (129.2 per 100,000)

<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>
<i>Age group (in years)</i>	<i># of prevalent HIV/AIDS cases</i>	<i>Population (2000)</i>	<i>2000 US standard population weight</i>	<i>Age-adjusted rate ((B÷C×D)×100,000))</i>
<1	0	61,381	0.013818	0.00
1-4	1	245,562	0.055317	0.02
5-14	35	675,388	0.145565	0.75
15-24	76	634,387	0.138646	1.66
25-34	566	734,417	0.135573	10.45
35-44	2,815	902,498	0.162613	50.72
45-54	2,789	771,970	0.134834	48.71
55-64	822	491,985	0.087247	14.58
65-74	129	396,458	0.066037	2.15
75-84	9	300,442	0.044842	0.13
85+ years	3	112,097	0.015508	0.04
Total	7,245	5,326,585	1	129.2

To see the effect of age-distribution on prevalence rates, see Table 1 below for a comparison of crude and age-adjusted rates by race/ethnicity.

Table 1. Crude and age-adjusted HIV/AIDS prevalence per 100,000 population on December 31, 2005 by race/ethnicity and gender: Massachusetts

State Total:	Crude rate per 100,000	Age-adjusted rate per 100,000
White (non-Hispanic)	136.0	129.2
Black (non-Hispanic)	1,315.1	1,427.3
Hispanic	927.2	1,217.4
Asian/Pacific Islander	79.8	85.7
American Indian/Alaskan Native	191.5	179.8
Total prevalence	251.5	245.7
Males:	Crude rate per 100,000	Age-adjusted rate per 100,000
White (non-Hispanic) Males	230.3	215.3
Black (non-Hispanic) Males	1,595.6	1,816.0
Hispanic Males	1,258.9	1,756.9
Asian/Pacific Islander Males	123.5	134.9
American Indian/Alaskan Native Males	174.9	166.6
Total prevalence among males	371.6	360.0
Females:	Crude rate per 100,000	Age-adjusted rate per 100,000
White (non-Hispanic) Females	48.8	47.6
Black (non-Hispanic) Females	1,054.1	1,094.0
Hispanic Females	603.6	742.9
Asian/Pacific Islander Females	37.6	38.6
American Indian/Alaskan Native Females	207.8	193.1
Total prevalence among females	139.7	138.0
¹ The denominators for prevalence calculations are based on year 2000 population estimates from the MDPH Bureau of Health Statistics, Research and Evaluation Data Source: MDPH HIV/AIDS Surveillance Program; data as of 7/1/06		

Table 2. Age-adjusted HIV/AIDS prevalence rate per 100,000 population¹ on December 31, 2005 by race/ethnicity and Health Service Region (HSR)²: Massachusetts

	Boston	Central	Metro West	North- east	South- East	Western	State Total
White NH	558.3	84.6	76.4	94.7	119.9	75.4	129.2
Black NH	1,386.0	1,610.6	1,394.9	1,544.1	1,138.4	1,000.9	1,427.3
Hispanic	1,103.0	1,290.1	556.3	840.3	1,244.0	1,661.6	1,217.4
API	129.0	67.3	43.8	132.6	56.7	44.9	85.7
AI/AN	290.2	167.9	0	233.1	144.9	65.8	179.8
Total	765.9	171.1	126.9	176.9	172.1	228.0	245.7

¹ Population sizes for rate calculations are based on year 2000 population estimates from the MDPH Center for Health Information, Statistics, Research and Evaluation

² Reflects the health service region of a person's residence at the time of report (not necessarily current residence); See Epidemiologic Profile General Appendices, Health Service Region Maps, available at http://www.mass.gov/dph/aids/research/profile2005/app5_hrs_maps.pdf for configuration of health service regions

NH = Non-Hispanic, API = Asian/Pacific Islander, AI/AN = American Indian/Alaska Native

Data Source: MDPH HIV/AIDS Surveillance Program, data as of 7/1/06

Table 3. Crude and age-adjusted rates of diagnosis of HIV infection per 100,000 population¹ by race/ethnicity and gender: average annual rate 2003–2005², Massachusetts

State total:	Crude rate per 100,000	Age-adjusted rate per 100,000
White (non-Hispanic)	6.6	6.3
Black (non-Hispanic)	86.5	89.3
Hispanic	52.9	62.6
Asian/Pacific Islander	6.0	6.0
American Indian/Alaskan Native	8.7	8.0
Total rate	14.1	13.7
Males:	Crude rate per 100,000	Age-adjusted rate per 100,000
White (non-Hispanic) Males	11.9	11.2
Black (non-Hispanic) Males	99.3	105.8
Hispanic Males	70.5	85.5
Asian/Pacific Islander Males	9.1	8.8
American Indian/Alaskan Native Males	5.8	5.4
Total rate among males	20.7	19.8
Females:	Crude rate per 100,000	Age-adjusted rate per 100,000
White (non-Hispanic) Females	1.6	1.6
Black (non-Hispanic) Females	74.6	74.6
Hispanic Females	35.6	42.0
Asian/Pacific Islander Females	2.9	3.3
American Indian/Alaskan Native Females	11.5	10.7
Total rate among females	8.0	7.8
¹ The denominators for rate calculations are based on year 2000 population estimates from the MDPH Center for Health Information, Statistics, Research and Evaluation		
² Reflects year of HIV diagnosis among all individuals reported with HIV infection, with or without an AIDS diagnosis		
Data Source: MDPH HIV/AIDS Surveillance Program, data as of 7/1/06		

Table 4. Age-adjusted rate of HIV diagnosis per 100,000 population¹ by race/ethnicity and health service region (HSR)²: average annual rate 2003–2005³, Massachusetts

	Boston	Central	Metro West	North- east	South- East	Western	State Total
White NH	25.1	4.5	4.2	4.5	5.7	4.2	6.3
Black NH	80.2	122.2	85.0	135.1	67.7	67.9	89.3
Hispanic	65.4	56.3	32.8	47.0	59.7	98.6	62.6
API	5.2	3.4	2.8	11.8	6.1	15.0	6.0
AI/AN	0	16.5	0	19.4	9.2	0	8.0
Total	39.7	10.1	7.7	11.2	8.9	14.3	13.7

¹ Population sizes for rate calculations are based on year 2000 population estimates from the MDPH Center for Health Information, Statistics, Research and Evaluation

² Reflects the health service region of a person's residence at the time of report (not necessarily current residence); See Epidemiologic Profile General Appendices, Health Service Region Maps, available at http://www.mass.gov/dph/aids/research/profile2005/app5_hrs_maps.pdf for configuration of health service regions

³ Reflects year of HIV diagnosis among all individuals reported with HIV infection, with or without an AIDS diagnosis
NH = Non-Hispanic, API = Asian/Pacific Islander, AI/AN = American Indian/Alaska Native

Data Source: MDPH HIV/AIDS Surveillance Program, data as of 7/1/06